

AMENDMENTS TO THE DRAWINGS

Please amend Fig. 3 according to the attached replacement drawing sheet. Each drawing sheet submitted herewith is labeled "Replacement Sheet" in the top margin.

REMARKS

In response to an Office Action mailed on July 5, 2006, Applicant respectfully requests that the above-listed amendments be entered and the Application be reconsidered. With entry of the above-listed Amendments, claims 1, 7, 8 and 16 are amended, and claims 22-23 are new. Thus, nineteen claims are presented for examination. Of these, claims 1, 8 and 16 are independent, and the remaining claims are dependent.

The Examiner objected to Fig. 3, because the drawing allegedly does not show every feature of the invention specified in the claims. Specifically, the Examiner asserted that Fig. 3 does not show doping the photodiode after the receiving electrode is coupled with the photodiode, as recited in claim 21. Fig. 3 has been amended to show that the photodiode can be doped before (i.e. at box 304) or after (i.e. at box 314) the receiving electrode is coupled with the photodiode. Support for this drawing amendment is provided in the application at least on page 7, lines 3-15, page 8, lines 14-17 and page 9, lines up 1-4. The specification is amended to conform with the drawing amendments. No new matter is added.

The Examiner objected to claims 1, 8 and 16 due to various alleged informalities. The Examiner suggested inserting the word "wherein" after the first instance of the word "photodiode" in line 4 of claim 1. The Examiner suggested adding the word "and" before the last clause in claim 1, as well as other minor grammatical corrections. Claim 1 has been so amended.

The Examiner raised similar objections to claims 8 and 16. The remarks and amendments made above with respect to claim 1 also apply to claims 8 and 16.

Claim 7 has been amended to correct a typographical error, in which the word "regions" was inadvertently omitted.

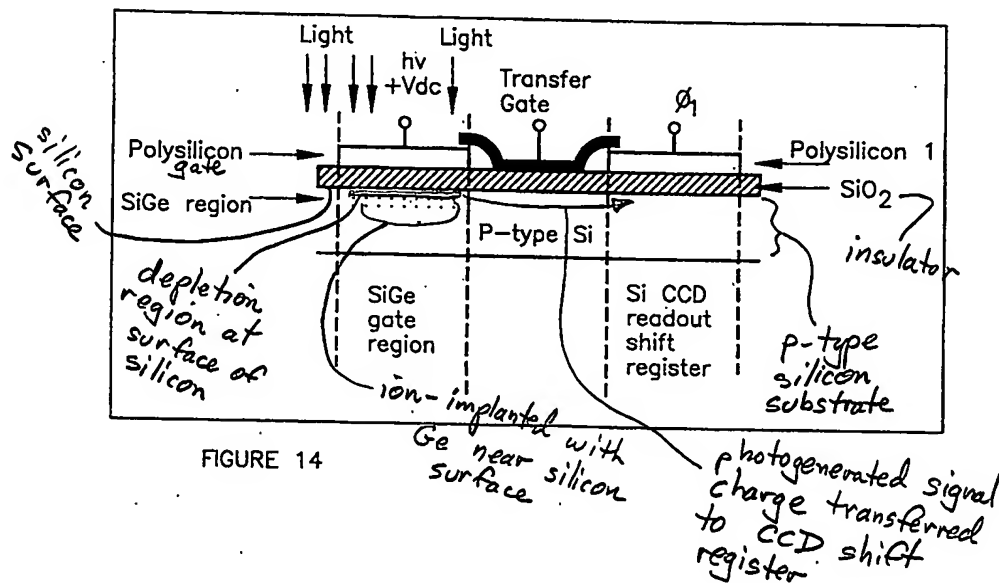
The Examiner rejected claims 1-2, 16 and 18 under 35 U.S.C. 102(b) as being anticipated by US Pat. No. 5,426,069 to Selvakumar *et al.* ("Selvakumar").

The Application discloses and claims a light conversion apparatus that includes a photodiode and a polysilicon-based, substantially transparent receiving electrode coupled with the photodiode. The receiving electrode collects photogenerated carriers (electrons or holes) produced in the photodiode as a result of light that passes through the electrode and into the photodiode, and the electrode conducts these carriers to another component. For example, amended claim 1 recites, "a polysilicon-based receiving electrode ..., wherein ... the photodiode

generates photogenerated carriers from the received light, and the receiving electrode is electrically coupled with the photodiode to extract the photogenerated carriers from the germanium-based photodiode and conduct the collected photogenerated carriers to another component. (Emphasis added.)

Selvakumar discloses a silicon-germanium photogate that includes a polysilicon gate. (Col. 6, lines 36-42; Fig. 14.) However, Selvakumar's polysilicon gate does not conduct photogenerated carriers from a photodiode to another component, as recited in amended claim 1. That is, Selvakumar's polysilicon gate is not a "receiving electrode," as recited in the claim.

When positively biased, Selvakumar's polysilicon gate forms a depletion region at the surface of a silicon substrate (not in the polysilicon gate). (Col. 6, lines 48-50; emphasis added.) (See annotated Fig. 14, below.) This surface depletion region collects and stores photogenerated signal charge. (Col. 6, lines 51-53 and 57-60.) At the end of an integration time, the photogenerated signal charge is transferred to a normal silicon CCD shift register. (Col. 6, lines 60-62; Fig. 15.) The signal charge is not, however, conducted by the polysilicon gate. Instead, the signal charge is conducted through the p-type Si material under a "transfer gate" shown in Fig. 14. Indeed, the polysilicon gate is electrically insulated from the depletion region by a SiO₂ insulating layer. Thus, the polysilicon gate cannot conduct the photogenerated signal charge.



Although Selvakumar discloses a transfer gate (Fig. 14), the photogenerated signal charge is not conducted by the transfer gate. As shown in Figs. 15 and 17 (reproduced below), the transfer gate is common to a plurality of SiGe photogates. Thus, if the signal were conducted by the transfer gate, the signal charges from all the SiGe photogates would be short-circuited together. Instead, the transfer gate is insulated from the p-type Si material by the SiO₂ insulating layer. The transfer gate simply forms the gate of a MOSFET or another component that acts as a switch between the photogate and the CCD shift register.

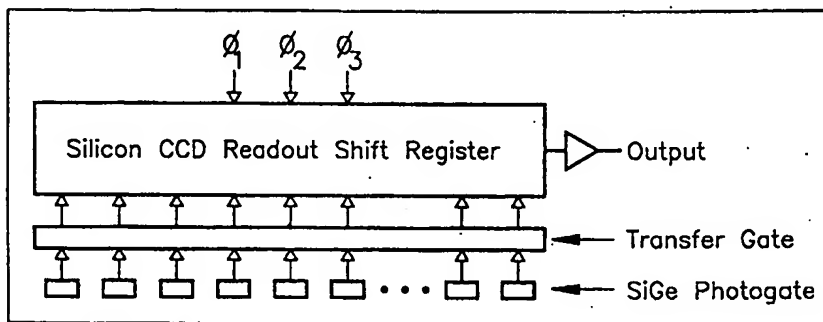


FIGURE 15

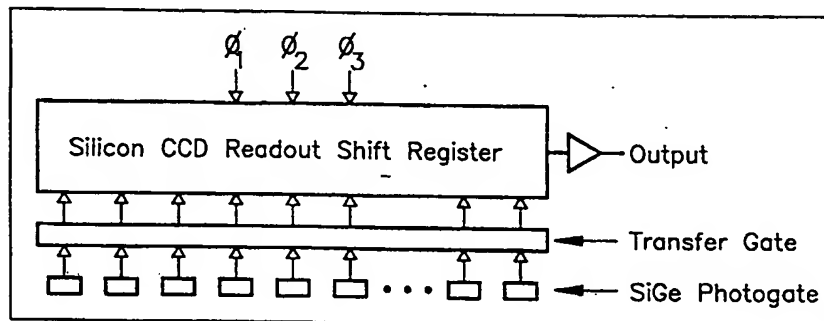


FIGURE 17

Thus, Selvakumar does not disclose a “receiving electrode” that: (1) permits received light to substantially pass through the receiving electrode to a photodiode and (2) extract photogenerated carriers (converted by the photodiode from the received light) and conduct the carriers to another component, as recited in amended claim 1. Furthermore, Selvakumar’s disclosure teaches away from such a receiving electrode, because Selvakumar’s polysilicon gate is electrically insulated from the region where photogenerated carriers exist.

In another part of the reference, Selvakumar discloses using metal to connect to the source, drain and gate of a formed MOSFET. (Col. 3, lines 56-57.) Metal is opaque, so

Selvakumar's metal does not anticipate or suggest the claimed polysilicon-based receiving electrode, which permits received light to substantially pass through the receiving electrode to the photodiode.

No art of record, either alone or in combination, discloses or suggests a light conversion apparatus that includes a germanium-based photodiode and a polysilicon-based receiving electrode that permits received light to substantially pass through the receiving electrode and is coupled with the photodiode to extract and conduct photogenerated carriers (produced by the photodiode) to another component, as recited in amended claim 1. (Emphasis added.) For at least this reason, claim 1 is believed to be allowable.

Claim 16 has been similarly amended and is believed to be allowable for at least the reasons given above with respect to claim 1.

Claims 2 and 18 depend directly from claims 1 and 16, respectively. Claims 2 and 18 are, therefore, believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

The Examiner rejected claims 3, 5-9, 12-15, 17, 19 and 21 under 35 U.S.C. §103(a) as being obvious over Selvakumar.

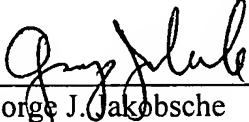
Claim 8 has been amended along the same lines as claim 1. Claim 8 is, therefore, believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

Claims 3, 5-7, 9, 12-15, 17, 19 and 21 depend directly or indirectly from claim 1, 8 or 16. These dependent claims are, therefore, believed to be allowable, for at least the reasons discussed above, with respect to claim 1.

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For all the foregoing reasons, it is respectfully submitted that the present Application is in a condition for allowance, and such action is earnestly solicited. Applicant hereby requests that any extension-of-time or other fee required for timely consideration of this application be charged to Deposit Account No. 19-4972. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present Application.

Respectfully submitted,


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